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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION

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U. S. S. "SARATOGA"

(See page 130)

Vol. XIII No. 360

PARALLELING the rage for cross-word puzzles, there recently swept across the country a severe epidemic of standardized etiquette. Large editions of imitation leather bound, de luxe books told how to set the table, when to raise the hat to a lady and a thousand and one other items that every new apartment dweller should know. Even today thousands of hopeful diners-out are worried to the point of indigestion because they cannot speak to the Italian or Greek waiter in perfect French.

It may be that this desire for social polish is a hopeful sign of the human model's desire to be as well finished as this year's pyroxylin lacquered automobile. But there may be a warning in the willingness of many people to accept the dogma of hypothetical "high society" as the gospel for human behavior.

Good manners, like good speech and character, are formulated to a large degree by the training and education that the individual obtains in the home and school. Culture is not acquired naturally like one's second set of teeth. The idea that teachers are born ready-made and need only a grammar school education has long since been abandoned; even parents now attend child study clubs or read books in order to learn how to raise their Johns and Marys.

Such investigations as that of Professor Cason, described on page 131, provide a basis for a new scientific etiquette. He has applied the technique of scientific method to everyday manners. His researches may demonstrate some common mannerisms as social offenses; the use of the wrong fork may peeve no one. Professor Cason will probably never write a book on etiquette. Nevertheless, the sociologist and the psychologist, tackling problems more important and vital than the social laws of the drawing room, will make life more pleasant and worthwhile.

Editorial

Science News-Letter, March 3, 1928

Navy's Largest Ship

Naval Engineering

THE U. S. Navy's largest ship, and the biggest aircraft carrier in the world, the *Saratoga*, appears on the cover this week. It is reproduced from a painting by Walter L. Greene for the General Electric Company, makers of the ship's 180,000 horsepower engines. One of the 83 airplanes that the ship can carry is shown taking off from the bow. The peculiar construction, in putting the turrets and superstructure to one side, in order that the planes may take off with full advantage of its 888 foot over-all length, is also evident.

The displacement of the vessel is 33,000 tons, its maximum depth 30 feet, while the greatest width is 106 feet. Besides the planes, however, it has quite a formidable armament of the usual variety, with eight 8-inch guns in turrets, and twelve 5-inch anti-aircraft guns. The latter battery should be able to repel effectually an entire squadron of enemy planes.

Science News-Letter, March 3, 1928

THE new cover design of the SCIENCE NEWS-LETTER is based on decorations in the building in Washington of the National Academy of Sciences and the National Research Council, in which Science Service has its home. Lee Lawrie was the sculptor. The figures at the top represent Light and Darkness, while the borders on the side, taken from the bronze doors at the entrance to the lobby of the building, represent the Spring and Summer signs of the zodiac.

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INTERPRETING week by week, the latest developments in the various fields of science, this magazine attempts also to present its articles in the most pleasing and readable topography and the most convenient arrangement.

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All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

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The great *classics of science* are reprinted and interpreted in order that the present generation may appreciate the long and interesting history through which science has evolved.

Editorial

Science News-Letter, March 3, 1928

Things That Get on Your Nerves

Psychology

By Emily C. Davis

"Jackie, don't shout so loud to the toy horsie. You'll annoy the people upstairs, again."

"And, Annabel, go tell the cook to wash those dishes better. It gets on my nerves to see the remains of breakfast on the dinner plates. And do stop chewing gum, Annabel."

Annabel, rising from a comfortable chair, drags herself out, remarking: "Well, cook won't be here long to get on your nerves, because she told me she simply can't stand hearing Aunt Louise talk about operations another single week."

Eggy plates, and the click of gum chewing, and a gloomy line of conversation—not great matters in life, but as upsetting to comfortable existence as a sharp grain of sand lodged in a sensitive eye.

Etiquette books are a total blank on this important social problem of "Other people's nerves and how not to get on them." And scientists have somehow overlooked this angle of social psychology—until now.

For several years, Dr. Hulsey Cason, professor of psychology at the University of Rochester, assisted by Eloise B. Cason, has been quietly collecting annoyances, as a naturalist collects beetles. Students and acquaintances have written out for him lists of all the things that irritate them, from the time they get up in the morning until they go to a dinner party, in the evening, and so home to bed.

Everybody likes to tell about his personal aversions, and the things he wishes his neighbors and friends wouldn't do, Dr. Cason soon found. In fact, it is harder to get people to stop than it is to start them talking.

Some of the helpers in the hunt for annoyances became so interested that they said: "Say, I will get mother to make a list of the things that annoy her. And the janitor—would you like to know what annoys the janitor?" Dr. Cason would, and his unique collection grew, until today he knows the things that annoy street car conductors, lawyers, school teachers, millionaires, children, grandmothers, flappers, icemen and policemen. And the mass of facts and figures, with which he is still working, show that there are at least 2,500 different ways of getting the world's goat.

What is the most annoying thing a person can do?

Everybody wants to know that. The questioner waits anxiously to

hear whether he is guilty of the world's greatest annoyance.

To see an animal cruelly treated seriously annoys more people than anything else, the psychologist answers. The second most annoying situation is to see a child harshly treated. The third, jumping from the semi-tragic to the semi-comic, is to see a hair in food.

"Few of us realize how many possible ways there are of annoying other people," said Dr. Cason, in discussing his investigation. "And very few realize that a person can make himself disliked if he displays only three or four of the pet aversions of his associates. If a man has a bad breath, for instance, has a dirty neck, and brags about his feminine conquests, he may make himself so unpleasantly conspicuous in the eyes of some people that they would consider him an impossible companion, though they may never completely analyze their reasons for dislike.

"It is rather pathetic to think that handicaps of this particular type could be removed, if the offender would only realize that his mannerisms are handicaps. It is particularly pathetic because the removable personal characteristics are frequently the very ones that irritate people the most. Dirty ears, untidy clothing, ill-kept hair, an onion breath, excessive cosmetics, missing teeth, and crude aggressive manners are the type of thing that people in general are least likely to overlook.

"It is a more cheerful fact that permanent physical characteristics are not nearly so annoying. Such handicaps as bow-legs, cross-eyes, warts, scars, being crippled, birthmarks, and excessive fatness are irritating to some, but not so much as we might expect. Apparently people are tolerant, knowing that such conditions cannot be helped."

People in ill health find life a little more exasperating than healthy people, the figures show.

Fat men uphold their reputation for being happy-go-lucky by having fewer annoyances than lean men. But fat women have more annoyances than thinner ones. Why? Dr. Cason suggests that the fat woman worries about her figure and all the problems it loads upon her—diet and tight clothes and unwanted exercise. The fat man, on the other hand, remains unruffled because he is not concerned to the same extent about what the world thinks of him.

Dr. Cason is the first psychologist to probe systematically some type of emotion in people of all ages. The emotions of old age particularly are an almost unexplored field. He has found that people of all ages are annoyed to approximately the same degree. Physical health and efficiency decrease with age, and the same is true of the senses, such as sight, hearing, smell, and taste. Pleasures become an old story and lose much of their youthful thrill. But sensitiveness to the things that we emphatically do not like remains as keen and sharp as ever, from nine years old to ninety.

Different ages, however, have characteristic annoyances. One of the particular irritations of childhood, Dr. Cason found from his child subjects, is to be told to do something just as you are about to do it of your own initiative.

Young people hate to get up in the morning. Old ones do not mind that.

Hearing jazz is no anoyance at all to the flapper and her beau, but after the twenty-five year milestone it begins to rasp on some people's nerves. And in old age, strange to say, women find jazz more distasteful than men do.

To see a woman intoxicated is less irritating to peo- (*Turn to next page*)

Nerves—*Continued*

ple between 30 and 35 years old than at any other age. To see a woman smoking a cigarette in public is moderately annoying to some young people. But the sight irritates the average old woman about as much as anything you can think of.

Comparing the sexes, the psychologist found that altogether women are annoyed considerably more than men. Nervous mannerisms, like sucking the teeth, cracking the joints, and biting the nails, worry women more than men. An encounter with bad table manners is much more likely to spoil a woman's day than a man's. Women get more incensed on sex matters, too. To see love making in public, to hear a woman talking about her men friends—a joke on a sex subject, to be spoken to familiarly by an unknown person of the opposite sex, such matters as these are much more annoying to women as a class than to men.

Another of Dr. Cason's discoveries is that both men and women find women a greater source of annoyance to them than men are.

Acting superior is one way of being a social pest. The lists of annoyances make that perfectly plain. And there are many different ways of acting superior. Inferiority, on the other hand, is much less offensive.

This investigation in social psychology provides the start of a new kind of etiquette guide, though Dr. Cason had no thought of that in mind when he started on his quest for knowledge. Where ordinary social guide books enlighten their eager readers on how to behave acceptably at a banquet and how to answer an invitation from the queen to play croquet, the new data on annoyances get close to the real courtesies of everyday life. You can test it for yourself by running down the following list of a few of the outstanding "goat-getters" to see how many provoke you. And then you can put the shoe on the other foot, and consider whether you irritate people on any of these counts:

A person habitually arguing.

A person in an automobile telling me how to drive.

A person driving an automobile taking unnecessary chances.

To hear a person chewing gum loudly.

A person crowding in front of me instead of waiting his turn in line.

A person picking his nose.

A young person showing disrespect to a much older person.

To hear a person talking continually about personal illnesses.

A person being inquisitive about my personal affairs.

To see a man intoxicated.

To hear a person talking during a musical number.

Being pushed when in a crowd.

To see a man (or woman) spit in public.

To see a person picking at a sore.

To hear a woman swear.

A person reading the movie titles aloud.

To be spoken to familiarly in a public place by a stranger of the opposite sex.

An acquaintance of the opposite sex trying to kiss or pet me.

A grown person talking baby talk.

A person talking a great deal and not saying anything very important.

A person in conversation with me and not listening to what I am saying.

A person talking when he has a good deal of food in his mouth.

A person continually complaining about something.

To find dirt in food I am eating.

The odor of garbage.

A dirty bathtub.

The odor of bad breath.

Excessive cosmetics on a woman.

Food on a person's face, near his (or her) mouth.

The odorous condition of a person's body.

To see decayed teeth.

Some annoyances affect almost every one. But many items on an individual's personal list depend on his experiences, occupation and acquired temperament. Very young children presumably do not have annoyances of the sort that Dr. Cason has been studying. But at some age before ten, at any rate, they begin to be sensitive to a good many of the sights and sounds that are distasteful to adults. Many of these are the result of direct instruction and training by older people, as in the case of table manners, morals, and general deportment. Some very strongly rooted aversions develop through an intense emotional experience. Being in a fire might make a little girl dislike the smell of smoke for the rest of her life, though she might not associate the two facts in her mind.

Annoyances fix themselves in our lives easily, Dr. Cason explains, because they are linked with emotions. We find it a long dreary grind to train our muscles to hit a golf ball with precision, but "nerves" will curl up most efficiently with distaste at the very next sight of a particular kind of food after a single meeting with it in an unsavory form.

Whether we can make ourselves much less sensitive to petty irritations is not certain. They are part and parcel of modern civilization. Primitive men, Dr. Cason points out, take life easily and apparently have few irritations. But in more complex surroundings, human beings are much more highly stimulated and by a greater variety of situations. They are inevitably more nervous and irritable.

But thinking about situations that annoy you, and especially talking frankly about them, seem to make certain ones less powerful, Dr. Cason has found. A good many of the people who helped him in his investigation said that after talking about their annoyances they began to feel that it was rather ridiculous to allow themselves to get irritated at some of the items. And later they reported that their annoyance at some situations had noticeably decreased. In many of these cases the original cause of the aversion or irritation was recognized for the first time, and by talking over the factors present in the original situation they profited by what the psychoanalyst, Freud, calls catharsis, Dr. Cason explains.

But some things are beyond the power of Freud. It is doubtful if any remedy will ever cure the civilized world of its aversion for hearing a person snore, or for seeing a fly in the soup.

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Canada has 105,000 Indian inhabitants.

The language of the Hawaiians has 12 letters.

Two-thirds of English people have light colored eyes.

Observation balloons were used during the Civil War.

About 1,000 asbestos theater curtains are made each year.

Iceland is the most sparsely populated country in Europe.

Rattlesnakes can be blinded by mustard gas shot into their retreats.

The Heavens in March

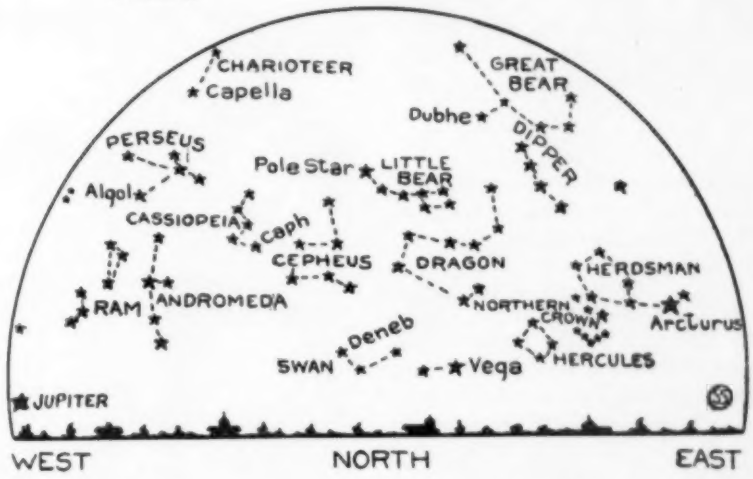
Astronomy

By James Stokley

What is probably the chief astronomical event of March occurs on Tuesday the 20th at 3:45 p. m. At least it is the one which is most welcome to many people, for that is when spring commences. The beginning of spring is not attended by any signs in the heavens, in fact, if it were not for the calculations of the astronomer, we should not know when it happened.

Well, then, one asks, what does happen at 3:45 p. m. on the twentieth, and why has that been selected as the beginning of spring? At that time the sun reaches the part of its path that is called the vernal equinox. Another way of putting it is to say that the sun reaches the first spring sign of the zodiac—the sign of Aries.

The sun, like the moon and planets, moves along a path in the heavens which is called the zodiac. To the ancient astrologers, who were the forerunners of modern astronomy, the position of the sun was most important, and had an influence upon people who were born at a particular time of the year. For that reason they divided the zodiacal belt into twelve "houses" or signs, three for each season. These signs were familiar in comparatively recent years, and even today to some extent, in patent medicine almanacs, which show a nude man with the signs around him, and lines connecting them with the particular part of his body which each was supposed to influence. The spring signs are Aries, the Ram; Taurus, the Bull, and Gemini, the Twins; summer, Cancer, the Crab, Leo, the Lion and Virgo, the Virgin; autumn, Libra, the Scales; Scorpio, the Scorpion, and Sagittarius, the Archer; and winter, Capricornus, the Sea Goat; Aquarius, the Water Carrier, and Pisces, the Fishes.

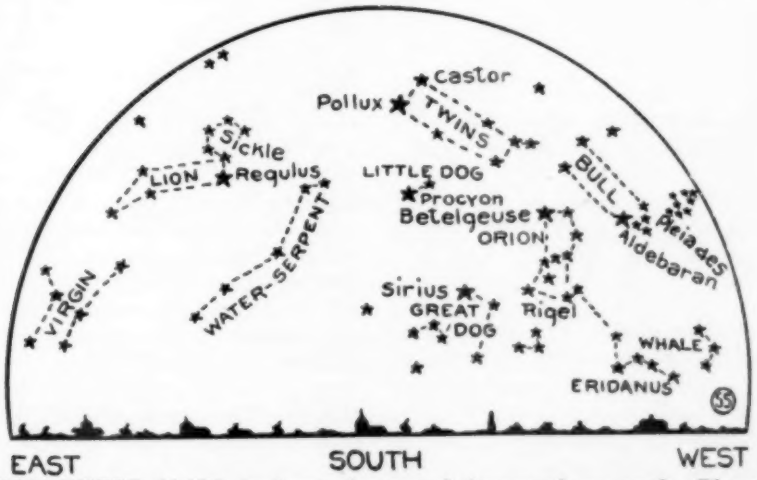


Of course, these names are all the names of constellations through which the sun moves, but it happens that when the sun enters the sign of Aries in March, it is actually in the constellation of Pisces. This was not always so, however. Thousands of years ago, when these signs were established, the signs and the constellations coincided, that being the reason that the former were so named. There is a gradual turning of the earth's axis, however, which is called precession. On account of it, the zodiacal constellations gradually slip around the zodiac, in a "great year" of 26,000 ordinary years. When that period has elapsed since the signs were first named, the constellations will again coincide with them.

Reputable scientists have long ago given up any belief in the influence of the stars on our lives in any such way as the ancient astrologers supposed. But the old names still continue, and we still use the signs of the zodiac that they employed. Even though astrology is now considered a pseudo-science, it is proper that the old astrologers should be thus commemorated. For they did lay the foundations for the modern study of the stars. The case is much the same with modern chemistry, which had its roots in the studies of the ancient alchemists.

The vernal equinox, the point which the sun reaches when it enters the sign of Aries, has another significance. It is the Greenwich of the skies. To locate a place on the earth we need to know its latitude and its longitude. The former is easily measured, for the earth is rotating on its axis, and this gives us a basis. The equator is the part of the earth farthest from the axis, and this makes a convenient reference line from which to measure latitude. In the case of longitude, however, the problem is not quite so easy. There is no natural reference line from which to measure it, so by universal agreement, astronomers, navigators and geographers have decided on the meridian of Greenwich as an arbitrary standard. This is an imaginary line which runs directly north and south through a certain telescope at the Greenwich Observatory, on the outskirts of London.

Two coordinates are also needed to locate the position of a star. Instead of calling them latitude and longitude, however, the astronomers have named (*Turn to next page*)



HOLD THESE MAPS in front of you and face north or south. The stars on March evenings will then appear as shown.

Heavens—*Continued*

them declination and right ascension. Declination, like latitude, to which it corresponds, is measured in the heavens from the celestial equator, which is simply a line that crosses the sky and is at all points directly above the equator of the earth.

As for the Greenwich of the sky, the point from which to measure right ascension, there is a convenient mark provided by the place at which the sun crosses the equator on its northward journey. This is the vernal equinox. The origin of the name is rather obvious, the first word meaning spring, and the latter equal nights, as at this time of the year, the days and nights are of equal length. Of course there is another equinox in the autumn, when the sun crosses the equator again on its way south, but the spring one is the one that has been adopted as the starting point of right ascension.

March is rather a lean month for planets. Only Jupiter is in the evening sky, and it is low in the west. By the end of the month it will be close to the sun, ready to disappear from sight altogether for a month or so, when it will again become a morning star.

One interesting astronomical event that will not be visible with the naked eye, but which can be seen readily with a pair of binoculars occurs on March 6. This is the occultation of a star in Virgo, which means that the moon comes in front of, or occults, the star. The moon will be full the same evening, which will mean that it will rise in the east as the sun sets in the west, and will appear as a completely luminous disc. The star is of the fourth magnitude, easily bright enough to be seen with the naked eye ordinarily, but hard to observe so close to the brilliant moon. For that reason some optical assistance, such as a good pair of binoculars or opera glasses, will be helpful.

The star will go behind the moon, the immersion as it is called, before moonrise, so that part of it will not be seen. But at 7:43 p. m., eastern standard time, when the moon will have risen for an hour or so, at points along the Atlantic seaboard, the star will emerge from behind the lunar disc. Of course, at points farther west, the moon will be still lower at the time, so that in the middle west it will all be over when the moon is sufficiently high to observe. But even there the glasses will reveal the star right above the moon. To watch a star emerge from occultation is most interesting. The moon has no atmosphere, so the star suddenly pops out. If an observer on the moon could watch a similar occultation by the earth, it would not occur in this way, but the star would gradually appear. This would happen because the thick layer of atmosphere near the earth's surface would greatly reduce the star's light. But as the earth moved on, the light from the star would gradually pass through more and more rarefied atmosphere, at the same time getting brighter and brighter. Occasionally we do observe occultations by another planet, such as Jupiter, and these appear the same way.

The stars are particularly glorious this month, for we have in the evening sky nine of the fifteen first magnitude stars that are ever easily visible from the United States. Over in the west is Orion, with its familiar "belt" of three stars, but which are not of such brightness. North of the belt, is Betelgeuse, reddish in color. In a ring around Betelgeuse are six other first magnitude stars. On the other side of the belt is Rigel, white in color. To the northwest is the ruddy Aldebaran, of the constellation of the Bull. To the north shines the yellowish Capella, in Auriga, the Charioteer. To the east is the orange Pollux, the brighter of the two twins, Gemini. To the southeast is Procyon, in the little dog, also yellowish white, while to the south shines the most brilliant of all stars, the white Sirius, in the big dog. Even farther to the west than Pollux we see the white Regulus, at the end of the handle of the sickle, in Leo, the lion, and low in the northeast orange Arcturus, in the kite-shaped constellation of Bootes, can be seen rising.

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The Egyptians made artificial eyes out of hollow balls of gold, cleverly enameled to resemble nature.

Tigers for zoo collections are more expensive than lions, because they are more difficult to capture.

Some hardwoods are transported on bamboo rafts in the tropics, because they are too dense to float.

A bronze bit, which had been used for chariot horses over 2,000 years ago, was recently dug up in Italy.

Proof Conclusive

Physics

LUCIO, in the *Manchester Guardian Weekly*:

(It has been mentioned that in the archives of the Patent Office there is filed a specification for making edible gramophone records from chocolate and other sweetmeats.)

Is Willie fond of music?
  It is his greatest treat;
That boy we never knew sick
  Of tuneful strains and sweet;
Dull tunes of ancient dozers
  Will keep him good for hours,
And works by great composers
  He literally devours.

He ate a whole cantata
  Last week without fatigue,
A Mendelssohn sonata,
  And a little thing by Grieg;
And then, right there before us,
  Absorbed beyond recall,
He ate the "Soldiers' Chorus,"
  And the "Funeral March from Saul."

And having paused to dally
  With a Chopin polonaise,
He ate a Gounod ballet
  And then the "Marseillaise."
The facts need but displaying—
  When feats like this are faced,
Are we not right in saying
  That music is his taste?

Science News-Letter, March 3, 1928

Science in Schools

Education

Leading article in *Nature* (London):

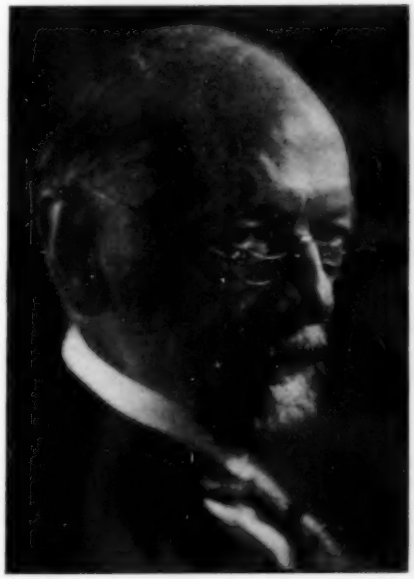
Although lip-service may be done to science in the prospectus and at the annual prize-giving, the classical tradition still holds undisputed sway in too many of our schools, where the classical side is recruited mainly from the most promising pupils, whose success in after-life is claimed as convincing proof of the superiority of gerund-grinding and the study of grammatical forms. What hope is there of progress? History answers that we must look to the man rather than to the machine. In the past, reforms have been effected by men like Huxley, Clerk Maxwell and Sanderson of Oundle, who combined high ability with oustanding fearlessness of character. It is to schools like Sanderson's Oundle, which do not fear to break with tradition and yet retain those character-forming elements that constitute the pride and justification of our great public schools, that we must look to supply the innovators and catalysers that our educational system still requires.

Science News-Letter, March 3, 1928

Inventor and Photographer

Photography

Whenever we look at a photograph reproduced in a newspaper or magazine by the halftone process, which is used in THE SCIENCE NEWS LETTER, we should feel our indebtedness to Frederic Eugene Ives. Perhaps it wouldn't be quite accurate to say that without his work we would have no halftones, for someone else might have turned out the process. But, in the words of Max Levy, another pioneer in the industry, "Ives was the first to demonstrate that good halftones could be made."



FREDERIC EUGENE IVES

The essential of the halftone process is the screen, a network of fine lines through which the original photograph is copied, and which breaks up the continuous lights and shades into the multitude of large and small dots that are seen when such a reproduction is examined with a magnifier. Mr. Ives invented the simple and ingenious method of making this screen by ruling parallel lines on two pieces of plane glass, and sealing these together, with the lines at right angles. Even more important, he worked out the optics of the screen, showing once and for all just where to place it between the plate and the lens in order to secure satisfactory results.

Mr. Ives discovered these principles in 1878, while he was in charge of the photographic laboratory at Cornell University. In that same laboratory he began his work on color photography. Combining it with his halftone process, he gave color printing to the world, by which method the color illustrations of our great magazines are made.

As he is an habitual inventor, these two great developments—color photography and the halftone—which might be supposed sufficient for the life of an ordinary mortal, are not his only contributions. He has found time on the side to invent a form of binocular microscope now in wide use, a method of making stereograms visible without a stereoscope, a form of colorimeter, and numerous other useful and interesting things.

Mr. Ives is a Connecticut Yankee, for he was born in Litchfield, Conn., on February 17, 1856. Since 1878 he has been engaged in commercial enterprises, most of the time in Philadelphia. During this time nearly two dozen medals and awards have come to him for his achievements, including nine from the Franklin Institute, and the coveted Rumford Medal of the American Academy of Arts and Sciences. He still is actively at work in Philadelphia, mostly on color movies.

And last, but not least of his claims to the respect of men of science, is the fact that he is the father of Dr. Herbert E. Ives, famous physicist of the Bell Telephone Laboratories, and under whose direction the successful Bell method of television was developed.

Science News-Letter, March 3, 1928

Machine Transplants Grain

Agriculture

A newly invented German machine, designed to do for Occidental grain fields what Chinese coolie labor has done for centuries in the rice fields of the East, is attracting considerable attention on the part of British agriculturists. Instead of sowing seed like an ordinary grain drill, it sets out sprouted and rooted seedlings at the rate of 12,000 plants per hour, one to every square foot.

It is claimed that this method of raising grain requires only one-thirtieth as much seed as now used, and that it will yield from three to five times as many bushels to the acre. This is said to be the result of the greater freedom each plant has to develop a more vigorous root growth beneath the soil, and especially to tiller, or "stool out," above its base. From 30 to 40 stalks per plant are usually developed.

Science News-Letter, March 3, 1928

Alphabet from Miners?

Philology

Phoenician miners, digging for turquoises to bedeck an Egyptian pharaoh, are believed to have been the first users of the Phoenician alphabet—forerunner of our modern alphabet. Inscriptions found in the wilderness of Sinai, near the ancient turquoise mines, have been translated by Prof. Romain Butin of the Catholic University of America and are pronounced the oldest known writings in the Phoenician alphabet. The inscriptions were carved about 1900 B. C., he concludes in reporting his translations in the forthcoming issue of the *Harvard Theological Review*.

The Phoenicians must have made their great contribution to the world's civilization even before this early date, he says, because the first attempts at alphabet signs would be more like pictures than those of the Sinai tablets. It is believed, however, that the invention took place in this remote region, for the use of the Hebrew workmen who could not read the difficult Egyptian hieroglyphics.

These Semites, who came from Phoenicia and Syria to work for the Egyptians, were not oppressed, and Prof. Butin says that very likely an Egyptian official aided some Semite leader to evolve the set of signs with which Phoenician consonant sounds could be spelled out. The working model for the alphabet signs is traced to the Egyptian picture writing found on monuments in the same region. Even the crudities of some of the Egyptian workmen are reproduced in some the alphabet signs.

The miners used the alphabet system chiefly to set up commemorative tablets with petitions to the Egyptian goddess Hathor, Goddess of Turquoise. Fourteen inscriptions in the ancient alphabet system have been found, and seven of these were brought to Cairo last summer by the Harvard-Michigan expedition, so that scholars might study them at first hand. It was in Cairo that Prof. Butin examined the tablets and began his work of translation, which is now completed.

The Harvard-Michigan expedition has anounced that it will return to the region of the Sinai mines in 1929, hoping to find additional tablets, perhaps more ancient samples of the alphabet.

Science News-Letter, March 3, 1928

Education, Science and Democracy*

General Science—Education

By Edwin E. Slosson

The object of the effort to spread a knowledge of science among as many people as possible is not with the view of converting them into scientists. That is impossible. A scientist is not one who reads science or studies science. A scientist is a man who makes science. This is a mere matter of language. A musician is a man who makes music. A novelist is a man who makes novels. A painter is a man who makes pictures. A contortionist is a man who makes cortortions. So a scientist is a man who is engaged in original research, who is converting the crude phenomena of nature into systematic and logical form.

But if nobody listened to music except musicians, nobody bought books except authors, and nobody looked at pictures except artists, and nobody cared for contortions except contortionists, these arts would not exert much influence in the world. So, too, we believe, science has a value for those who, for lack of time, taste or capacity, can never become professional scientists.

The scientist, pure and simple, is concerned only with the accumulation of knowledge. He usually does not care to bother about its dissemination. What he writes is unread except by the few who are specially interested in the same specialty. And sometimes even they are not able to read it without propping their eyelids up with toothpicks.

It is then not merely because of mental inertia that the average of public opinion lags some ten or twenty years behind scientific thought. It is partly because of lack of opportunity to become acquainted with the recent results of scientific research. Public ignorance has naturally been followed by public indifference. Time was when the microscope and atlas of the heavens formed a part of every gentleman's library; when "Shakespeare and the musical glasses" ranked together in London conversation; when culture was held to include an acquaintance with the latest thing in science as well as in art or music. But nowadays a man who would be ashamed to confess ignorance of Epstein or Scriabin does not manifest the least curiosity to know of Einstein or Millikan.

But this popular ignorance and indifference in regard to science can readily be remedied. *The beauty and meaning of scientific discoveries can be revealed to the general reader if there is an intermediary who can understand equally the language of the laboratory and of the street.* The modern journalist knows that anything can be made interesting to anybody if he takes pains enough with the writing of it. It is not necessary either to pervert scientific truths in the process of translation into the vernacular. The facts are sensational enough without any picturesque exaggeration.

It is the business of the journalist to build bridges across the chasms which divide humanity, to act as interpreter between all those who speak different languages. We have on the one side a public too often indifferent to the doings of scientific men. We have on the other scientific men who too often are indifferent to the public. There is an esoteric tendency in science as in all professional work. * * *

This attitude is quite natural. It is no advantage to the investigator to be written up. On the contrary, it usually injures him in the estimation of his colleagues without gaining for him the esteem of anyone else. The journalist often destroys a reputation in the attempt to make one. * * *

This is one reason why each science develops a language of its own. A technical vocabulary serves the purpose of a private telephone system, connecting members of the same guild so they can talk to one another anywhere in the world without being overheard and interrupted by outsiders. * * *

But while we must recognize that a secret language has its advantages in securing freedom for the logical development of a science, yet there is need for the interpreter to bring the results of scientific investigation as quickly as possible to the knowledge of those who are to put them into effect. It was to meet this need that Science Service was founded at Washington by the generosity of a public-spirited man, the late E. W. Scripps, as a philanthropic and non-profit-making institution for the popularization of science.

To provide the public with the means of easy accurate scientific information throughout life is a difficult and important task. But it is much more difficult and vastly more important to develop the habit of scientific thinking. The acceptance of a single scientific fact by any man, or any multitude of men, does little good if it leaves the mind of the man unmoved. What he needs is greater appreciation of the experimental processes by which scientific principles are discovered and established. Otherwise he will not be able to distinguish between genuine scientific discoveries and their pseudomorphs, the fakes, in afterlife. He will not know how to distinguish the man who knows from the man who pretends to know. This ability is more important in a democracy than anywhere else. The danger in an aristocracy is that the people will respect and follow those that are not worthy. The danger in a democracy is that the people will fail to respect and follow those who are worthy of such confidence. Envy of the expert is a common human failing. We none of us are free from the desire to look down on those who have the right to look down upon us. We all of us take a secret delight in the humiliation of our superiors, and we rejoice in disclosing the ignorance of those who know more than we do. This natural human weakness becomes a public menace when it is multipled by a million. It accounts for the votes cast against Aristides the Just and for the disposition to elect as our representatives not outstanding men but average men. This does not matter much in ordinary political affairs, for politics is not yet a science and there are many ways of reaching the same result. In science there is only one truth, but an infinitude of falsehoods. An unwise popular vote on a political question may bring a temporary calamity upon a nation, but an unsound popular opinion of a scientific question may bring permanent ruin to a race. The fate of the nation depends less on how the people cast their ballots than on how they combine their chromosomes.

The main object of education in a democracy is not to teach the people how to vote right, but to train them how to think right. Under any form of government, in an autocracy no less than in a democracy, the real power lies in the people, and it is their individual conduct, guided by their personal beliefs, that determines whether the nation shall advance, stagnate or retrograde.

*Extracts from an address on "Adult Education in Science."

$3,000 Good Pay for Women

Economics

A woman with a salary of over $3,000 a year belongs to the exceptional minority, Mrs. Chase Going Woodhouse of the U. S. Bureau of Economics told the National Education Association in reporting the results of a salary survey of over 3,000 single women with full time jobs.

"As one might expect, by far the greater number, 2,321 to be exact, were in educational work, and 718 in all other fields," Mrs. Woodhouse said. Of those in educational work 194 were in administrative work and 2,127 teaching.

"The best paid women in this group were the three college presidents with an average salary of $8,200. Next came the nine principals of junior high schools, with an average salary of $3,859, four normal school principals with $3,800, and fifty-two college deans with $3,426. In teaching the highest average salary was $2,457 for the colleges, and the lowest $1,632 for the grade schools.

"Apart from educational work, fifty-two occupations were reported. The best paid woman was an executive in a commercial organization. She made $34,000 a year besides dividends on her stock. I think she illustrates a practice which we ought to encourage, that is to enter the family business. This step, so usual for men, is quite exceptional for women.

"The usual assumption that business pays better than the professions is not true of this group. The managers of cafeterias and tearooms averaged $3,300, and interior decorators $3,146; but all other women in business averaged less than $3,000. In the professional groups statisticians averaged $3,750, lawyers $4,587, Physicians $3,551, research workers $3,271.

"Is a higher degree an economic asset? To a librarian an M. A. is worth on the average $193 a year, and a Ph. D. $600. This is good interest on the investment."

Science News-Letter, March 3, 1928

Electrons in Hurry

Physics

Less than a three billionth of a second is all the time that it takes an electron to be knocked out of a film of potassium metal when light strikes it in a photoelectric cell—the device that has made television and radio photographs possible. At the New York meeting of the American Physical Society Dr. Ernest O. Lawrence and Dr. J. W. Beams, of Yale University, told of their studies of the length of time required for this "photoelectric effect."

In the photoelectric cell there is a film of potassium, and another electrode. When light strikes the film the electrons travelling from the film to the other electrode cause a minute electric current, which can be amplified by means of vacuum tubes. In this way a current of any desired magnitude but one which varies with the illumination of the cell, can be obtained. Because the response of the cell is practically instantaneous, it can be used in television and wire and radio photographic service.

Science News-Letter, March 3, 1928

Baby Handbag

Medicine

A de luxe portable outfit for transporting premature babies to hospitals has been invented by Dr. Julius H. Hess of Chicago.

Many infants die of thermal shock while they are being conveyed to hospitals equipped with baby incubators where they can be kept at an even warm temperature until they are strong enough to survive in a cold world. To meet this condition, Dr. Hess has devised an electrically heated handbag 24 inches long, 14 inches wide and 17 inches deep.

"A composite heating unit," he explained in reporting his invention to the American Medical Association, "permits the use of the 110 volt light current, either direct or alternating, the 32 volt current of the Pullman car, or the 6 volt current of the automobile battery. Insulated walls prevent sudden temperature change under any conditions."

An adjustable shutter at the top and another at the side regulates the ventilation while a disc thermometer mounted on the outside registers the temperature of the interior. A glass window in the top of the bag and an electric bulb inside allow observation of the minute occupant during transportation.

Science News-Letter, March 3, 1928

Testing Metal With Radium

Physics

Using radium rays so penetrating that they can go through pieces of 15-inch metal to test for hidden flaws in large castings is one of the latest accomplishments of the Russian State Radium Institute at Leningrad.

These "gamma rays," as they are called, are similar to X-rays, but are of much shorter wave length. They are more penetrating and can pass through pieces of metal too thick to be examined with the X-rays. Examination by radium is said also to be cheaper than with X-rays, because the same radium can be used over and over for an indefinite time. Large and expensive photographic plates are not required, since the rays, after passing through the object, act upon a special, sensitive electroscope. The test record is preserved for future reference in the form of a simple diagram automatically traced. Another advantage is that gamma rays speed up the inspection—it may be cut down to a couple of minutes for a large casting—while X-rays require a very long exposure, often of several hours, when metal is more than two or three inches thick.

The apparatus, as developed by the Russian scientists, is very simply constructed. A tiny glass capsule with a radium preparation is inserted into a deep hole bored in a large lead ingot. This stops all rays, except a narrow strong beam that goes along the bore. This beam pierces the casting and encounters two filaments charged with electricity and enclosed within a copper cage. There is an air space between the filaments and the cage which act normally a perfect insulator, allowing no electric current to pass through it. But as soon as gamma-rays have a chance to get in the cage they ionize the air and turn it into a conductor.

Electricity, from a battery, flows from the filaments to the copper cage and from it passes through a galvanometer and back to the battery.

As intensity of the rays changes with thickness of metal pierced by them, the rate of ionization varies accordingly. Therefore the flow of electric current exactly mirrors the shape of the object under test. Any deviation at once shows that some imperfection is present.

Science News-Letter, March 3, 1928

The Continuity of Knowledge

General Science

President A. LAWRENCE LOWELL *of Harvard University in his annual report*:

Within the memory of men still in middle life a marked change has taken place in the outlook of scholars, and especially of those who deal with the physical sciences. The prodigious extention of knowledge in the nineteenth century caused a restriction in the field of the individual, for no longer could anyone be familiar with all that was known in more than a single branch of learning, and often only in a subdivision of that branch. A Casaubon had become an impossibility, and in his place had come a number of specialists working in their distinct subjects. From time to time the propounding of new comprehensive laws or hypotheses that group many facts about general principles has opened the way for wider conceptions and further progress. The theories of conservation of matter and of energy did this for physics, the atomic theory did the same for chemistry, evolution for biology, and bacteriology for medicine. But the large number of scientific investigators amassing detials by special researches under these laws raised such a cloud of facts as again to make vision difficult for more than a short distance. Limited specialization was on the whole particularly noticeable in America owing to the absence of the broader academic traditions of Europe; and it is, perhaps, natural that here also a change in attitude should be more pronounced.

The shift in the standpoint of scholars, and notably of the younger men of science, has been due to a still greater extension of knowledge. Dividing lines between the different subjects, which formed barriers about them, have been breaking down. No one knows today exactly where they fall between physics and chemistry, or between zoology and botany. The new problems are intimately related to both; and even fields formerly so far apart as physics and biology are learning how much light one can derive from the other. All this is eminently true of medicine, which is coming to be regarded much more than in the past as a single whole, no essential part of which can be fully understood without the aid of all the rest. Memory of details is less important in medical education than a thorough comprehension of the relation to one another of its component principles.

What is true of science is true of other subjects also. All of them are learning that they cannot live a full life alone, for they touch one another at many points where they need each other's help; and thus the rigid boundary walls that separated them are crumbling. The sharp severance is giving way, and we are perceiving that all subjects pass imperceptibly into others previously thought distinct. As yet it is at their peripheries, at their points of contact, that the various subjects are tending to fuse. The vesture of thought appears as an unbroken fabric extending from one portion to the next. Men are interested today not so much in the philosophic unity as in the continuity of knowledge.

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All of the pictures in the famous Louvre gallery at Paris are being tested by X-rays to detect alterations and to expose fakes.

The oldest Chinese maps known to exist are cut on stone tablets dated 1137 A. D., but Chinese history refers to a map used as early as 227 B. C.

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Physiological Sectionalism

Physiology

WALTER C. ALVAREZ, in *The Mechanics of the Digestive Tract* (Hoeber):

A centipede is a colony of legs, each segment of which can walk and attend to its own affairs. Normally they all follow the lead of the head segment. If we cut the nerve cord we get, in effect, two independent centipedes, one of which may want to stand still while the other wants to walk off. The result is that the animal turns from time to time to bite savagely at its rear half which it seems to regard as a foreign body. The hind end of a planarian worm which has grown too long for efficient conduction fails to follow the lead of the front end; it takes firm hold of the aquarium wall, the front end crawls on unconcernedly, and the worm is pulled in two.

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The American beeswax crop is valued at four million dollars a year.

Spices are spicy because of the aromatic oils secreted in the plant.

Some birds have such keen vision that they can see a worm on a leaf three or four hundred feet away.

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Washington's Birthday Comet

Astronomy

Washington's birthday was celebrated in Germany by the discovery of a new comet—the first of 1928—announced Dr. Harlow Shapley, director of the Harvard College Observatory. The discovery was made by Dr. K. Reinmuth, of the observatory at Heidelberg University, where numerous discoveries of comets and other astronomical bodies have been made in recent years.

When first observed, the comet was in the constellation of Cancer, the crab, and was slowly moving towards the west. Cancer is in the south in late February and early March evenings about 11:00 o'clock, and is just to the right of the familiar "Sickle" in Leo, the lion. However, the comet was of the twelfth magnitude, much too faint to be seen with the naked eye. Astronomers cannot tell whether or not it is likely to become visible to the unaided eye until its orbit has been calculated.

The comet will be known after the name of its discoverer as Reinmuth's comet. It will also be recorded in astronomical annals as 1928a, indicating that it is the first to be discovered this year. At the end of January the discovery of a new comet was reported from an observatory in Algeria, which, it was then thought, would bear this designation. It later proved that the supposed comet was really a defect on a photographic plate. As the Heidelberg Observatory specializes in photography of comets and similar objects, and is generally recognized by astronomers as one of the chief centers of this phase of astronomical science, it is supposed that this new discovery is entirely authentic.

Science News-Letter, March 3, 1928

Snow and Steam From Volcano

Volcanology

Mt. Lassen, America's principal active volcano, is still asleep, but the spectacular effect produced by blowing clouds of snow, mixing with the steam that the crater is continually emitting, may give the illusion of a return to activity. The effect is especially striking when it occurs near sunrise or sunset, reports R. H. Finch, associate volcanologist of the U. S. Geological Survey, whose job it is to keep his finger on the pulse of the slumbering volcano. That it is merely slumbering, and not dead, is indicated not only by the steam, but by frequent earthquakes. Sometimes several shocks occur on the same day.

Evidence of subterranean activity also comes from Glass Mountain, about 75 miles north of Lassen Peak, and in the Modoc lava beds. Fairly recent lava flows are to be found nealy all the way between Glass Mountain and Lassen Peak, and Forest Service officials in the vicinity report about half an acre of land covered with pumice which is very hot. By digging but a little way into the pumice much higher temperatures are reached, and near the pumice bed is a deep fissure emitting steam.

With George L. Collins, of the National Park Service, Mr. Finch attempted to make temperature measurements and to take photographs on the mountain, about 7,850 feet high, during January, but were driven back by a heavy snow storm. They are now planning to conduct further explorations in the spring.

According to the Indians the heat of Glass Mountain has been known for many years, and earthquakes originating in the mountain and accompanied by rattling noises have been noted by Forest Service Officials for at least 15 years.

Science News-Letter, March 3, 1928

Good Crows

Ornithology

Even the despised crow has its defenders in Germany. A large number of the black marauders have been killed lately by means of poisoned eggs. Friends of the crow decry this practice, claiming that in spite of its undoubted mischievous and thievish habits, it still has its counterbalancing usefulness as a destroyer of field mice and similar vermin.

Science News-Letter, March 3, 1928

Two Million Colors

Physics

Necktie and clothing manufacturers probably still have plenty of colors left with which to add to the brilliance of life. Altogether there are slightly over two million separately distinguishable colors possible. This is the conclusion reached by George B. Welch, of Cornell University.

Science News-Letter, March 3, 1928

Nature Ramblings

By Frank Thone

Natural History

Horsetails

One of the most interesting of outdoor sights, when late winter is hesitating on the verge of the first frosty week of spring, is a bed of the spore-bearing shoots of the horsetail or scouring rush, pushing its way up into the chill air in a wayside ditch. There is something eldritch, gnomelike, about these stiff, leafless, jointed stems, each bearing at its summit a symmetrical little cone marked off with what look like even, six-sided scales.

As a matter of fact, the other-earthly appearance of the horsetail is not inappropriate, for the horsetails we see are the relics of an earlier earth. They are the last roses of a very long geological summer. They are among the oldest of all the plants, and in the heyday of their tribe, during the Coal Age, they were giants with trunks a foot in diameter and fifty feet or so in height. As has often happened in the course of geological history, the big members of the tribe fell first in the face of changing climatic conditions and the competition of newer species of plants, leaving the meekest of their kind to inherit the earth, or at least so much of it as the newer vegetation would spare them.

The plants get their name, horsetails, from the bristly, much-branched non-fruiting stalks of some of the species, which do have a more or less superficial resemblance to the jointed tail of an animal. Their other name, scouring-rushes, comes from their usefulness as pot-cleaners in old-time kitchens. Long before the modern much-advertised scouring bricks and powders ever reached the market, the stems of these humble vegetables made copper and tinware bright. The interesting thing about it is that the harsh stiffening of the scouring-rush's stem and the effective scraping flakes of the scouring powder are both made of the same chemical substance—silica.

Science News-Letter, March 3, 1928

How to Use Index Word Feature

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CLASSICS OF SCIENCE: Carbon in Plants

Physics—Chemistry

Liebig gives the following experiment to prove that plants absorb carbon dioxide and give off oxygen: "The leaves and other green parts of a plant absorb carbonic acid, and emit an equal volume of oxygen. They possess this property quite independently of the plant; for if, after being separated from the stem, they are placed in water containing carbonic acid, and exposed in that condition to the sun's light, the carbonic acid is, after a time, found to have disappeared entirely from the water. If the experiment is conducted under a glass receiver filled with water, the oxygen emitted from the plant may be collected and examined. When no more oxygen gas is evolved, it is a sign that all the dissolved carbonic acid is decomposed; but the operation recommences if a new portion of it is added. Plants do not emit gas when placed in water which either is free from carbonic acid, or contains an alkali that protects it from assimilation."

ORGANIC CHEMISTRY in its Applications to Agriculture and Physiology. (1840) By Justus Liebig, M.D., Ph.D., F.R.S., M.R.I.A., &c., Edited from the manuscript of the author by Lyon Playfair, Ph.D. First American Edition, with an introduction, notes, and appendix, by John W. Webster, M.D. Cambridge (Mass.) 1841.

JUSTUS VON LIEBIG

Carbon in Soil Increases

Let us now inquire whence the grass in a meadow, or the wood in a forest receives its carbon, since there no manure,—no carbon,—has been given to it as nourishment? and how it happens, that the soil, thus exhausted, instead of becoming poorer, becomes every year richer in this element?

A certain quantity of carbon is taken every year from the forest or meadow, in the form of wood or hay, and, in spite of this, the quantity of carbon in the soil augments; it becomes richer in humus.

It is said, that in fields and orchards all the carbon which may have been taken away as herbs, as straw, as seeds, or as fruit, is replaced by means of manure; and yet this soil produces no more carbon than that of the forest or meadow where it is never replaced. It cannot be conceived that the laws for the nutrition of plants are changed by culture,—that the sources of carbon for fruit or grain, and for grass or trees, are different.

It is not denied that manure exercises an influence upon the development of plants; but it may be affirmed with positive certainty, that it neither serves for the production of the carbon, nor has any influence upon it, because we find that the quantity of carbon produced by manured lands is not greater than that yielded by lands which are not manured. The discussion as to the manner in which manure acts has nothing to do with the present question, which is the origin of the carbon. The carbon must be derived from other sources; and as the soil does not yield it, it can only be extracted from the atmosphere.

In attempting to explain the origin of carbon in plants, it has never been considered that the question is intimately connected with that of the origin of humus. It is universally admitted that humus arises from the decay of plants. No primitive humus, therefore, can have existed; for plants must have preceded the humus.

Now, whence did the first vegetables derive their carbon? and in what form is the carbon contained in the atmosphere?

These two questions involve the consideration of two most remarkable natural phenomena, which by their reciprocal and uninterrupted influence, maintain the life of the individual animals and vegetables, and the continued existence of both kingdoms of organic nature.

One of these questions is connected with the invariable condition of the air with respect to oxygen. One hundred volumes of air have been found, at every period and in every climate, to contain twenty-one volumes of oxygen, with such small deviations, that they must be ascribed to errors of observation.

Although the absolute quantity of oxygen contained in the atmosphere appears very great when represented by numbers, yet it is not inexhaustible. One man consumes by respiration 45 Hessian cubic feet of oxygen in 24 hours; 10 centners of charcoal consume 58,112 cubic feet of oxygen during its combustion; and a small town like Giessen (with about 7000 inhabitants) extracts yearly from the air, by the wood employed as fuel, more than 1000 millions of cubic feet of this gas.

When we consider facts such as these, our former statement, that the quantity of oxygen in the atmosphere does not diminish in the course of ages,—that the air at the present day, for example, does not contain less oxygen than that found in jars buried for 1800 years in Pompeii,—appears quite incomprehensible, unless some source exists whence the oxygen abstracted is replaced. How does it happen, then, that the proportion of oxygen in the atmosphere is thus invariable?

The answer to this question depends upon another; (*Turn to next page*)

New Fossil Footprints

Paleontology

New finds of fossil footprints in the rocks of the Grand Canyon of Arizona, but this time on the north rim, fourteen miles from the site of previous discoveries on the south rim, are reported by Dr. Charles W. Gilmore of the U. S. National Museum and Glenn E. Sturdevant, government naturalist of Grand Canyon National Park.

Slabs bearing the foot imprints of small reptiles or salamander-like amphibians were found at two levels, one in the Coconino and one in the Supai formation. These correspond with two of the three formations on the other side of the Canyon in which tracks have been found during the past few years, but further exploration and examination of specimens will have to be carried on before it can be determined whether the levels match up exactly and whether the tracks represent the same kinds of feet.

The fossil footprints from the south side of the Canyon thus far discovered represent 36 species, distributed among 28 genera.

Do You Know That—

A new lock for the North Sea Canal will be larger than any on the Panama Canal.

Plate glass is rolled from a soft hot mass, like pie crust, with steel rollers.

Almost every important nation in the world manufactures oceanographic and topographic charts.

In order to lift the average adult, a balloon must have about 4,000 cubic feet of gas.

A city of bungalows, offices, and stores entirely for airmen is being built in Wisconsin.

Telephónes are being used to communicate between the head and rear ends of long freight trains.

A new refrigerator invented by Swedish engineers keeps cool with heat, burning about three cubic feet of gas per hour.

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Liebig—*Continued*

namely, what becomes of the carbonic acid, which is produced during the respiration of animals, and by the process of combustion? A cubic foot of oxygen gas, by uniting with carbon so as to form carbonic acid, does not change its volume. The billions of cubic feet of oxygen extracted from the atmosphere, produce the same number of billions of cubic feet of carbonic acid, which immediately supply its place.

Carbonic Acid in Air Constant

The most exact and most recent experiments of *De Saussure,* made in every season, for a space of three years, have shown, that the air contains on an average 0.000415 of its own volume of carbonic acid gas; so that, allowing for the inaccuracies of the experiments, which must diminish the quantity obtained, the proportion of carbonic acid in the atmosphere may be regarded as nearly equal to 1-1000 part of its weight. The quantity varies according to the seasons; but the yearly average remains continually the same.

We have no reason to believe that this proportion was less in past ages; and nevertheless, the immense masses of carbonic acid, which annually flow into the atmosphere from so many causes, ought perceptibly to increase its quantity from year to year. But we find, that all earlier observers describe its volume as from one half to ten times greater than that which it has at the present time; so that we can hence at most conclude, that it has diminished.

It is quite evident, that the quantities of carbonic acid and oxygen in the atmosphere, which remain unchanged by lapse of time, must stand in some fixed relation to one another; a cause must exist which prevents the increase of carbonic acid, by removing that which is constantly forming; and there must be some means of replacing the oxygen, which is removed from the air by the processes of combustion and putrefaction, as well as by the respiration of animals.

Both these causes are united in the process of vegetable life.

The facts which we have stated in the preceding pages prove, that the carbon of plants must be derived exclusively from the atmosphere. Now, carbon exists in the atmosphere only in the form of carbonic acid; and, therefore, in a state of combination with oxygen.

It has been already mentioned likewise, that carbon and the elements of water form the principal constituents of vegetables; the quantity of the substances which do not possess this composition being in very small proportion. Now, the relative quantity of oxygen in the whole mass is less than in carbonic acid. It is therefore certain, that plants must possess the power of decomposing carbonic acid, since they appropriate its carbon for their own use. The formation of their principal component substances must necessarily be attended with the separation of the carbon of the carbonic acid from the oxygen, which must be returned to the atmosphere, whilst the carbon enters into combination with water or its elements. The atmosphere must thus receive a volume of oxygen for every volume of carbonic acid which has been decomposed. . . .

The presence of a rich and luxuriant vegetation may be conceived without the concurrence of animal life, but the existance of animals is undoubtedly dependent upon the life and development of plants.

Plants not only afford the means of nutrition for the growth and continuance of animal organization, but they likewise furnish that which is essential for the support of the important vital process of respiration; for besides separating all noxious matters from the atmosphere, they are an inexhaustible source of pure oxygen, which supplies the loss which the air is constantly sustaining. Animals, on the other hand, expire carbon, which plants inspire; and thus the composition of the medium in which both exist, namely, the atmosphere, is maintained constantly unchanged.

Justus von Liebig was born in Darmstadt, Germany, May 4 or 12, 1803, and died in Munich April 10, 1873. His interest in chemistry was intense by the time he was fifteen. With a Ph.D. from Erlangen University, he went to Paris at nineteen, lamenting that he had wasted so much time trying to learn chemistry in the then poorly equipped schools of Germany. He completed important investigations of the fulminates of silver and mercury in Gay-Lussac's laboratory in 1824, and in the same year was appointed extraordinary professor of chemistry at Giessen. There he had adequate equipment for experiment installed, and his classes became the most famous center of chemical research in the world. In 1832 Liebig and Wöhler worked out the composition of oil of bitter almonds, and discovered the series of benzoyl compounds. The two researchers remained friends for the rest of their lives. About 1838 the study of the chemistry and physiology of plants and animals claimed Liebig's attention, and he worked in that field for the next thirty-five years. From 1845 to 1850 he tried out his theories of soil chemistry and artificial fertilizers by experimental farming. In 1852 Liebig went to Munich as professor of chemistry, occupying that position until his death.

FIRST GLANCES AT NEW BOOKS

INDEX BIOLOGORUM—Edited by G. Chr. Hirsch—*Julius Springer, Berlin.* Biologists will welcome this new world list of the members of their profession, which gives evidence of much careful work on the part of the editor. The arrangement of the principal name-list in a single alphabet, instead of by institutions and in order of academic rank after the too common European fashion, is especially to be commended. As might be expected in a first edition of such a directory, there are numerous omissions, which the editor solicits the cooperation of his fellow-biologists in remedying.

Biology
Science News-Letter, March 3, 1928

AMERICAN UNIVERSITIES AND COLLEGES—Edited by David Allan Robertson—*Scribners.* In the 884 pages of this volume can be found a complete list of American institutions of higher learning, with brief accounts of their organization and work, lists of leading institutions in graduate work, and chapters on the general characteristics of our colleges, all of which will make it invaluable to high school teachers and principals who have occasions to advise their students on such matters.

Education
Science News-Letter, March 3, 1928

THE COMMONWEALTH FUND—Annual Report, 1927. $1,100,000 was spent by the fund last year to improve the health of American children and this book tells what was done with it.

Hygiene
Science News-Letter, March 3, 1928

THE HARVEST—L. H. Bailey—*Macmillan* ($1.50). A series of ruminative essays, flavored with mellow reminiscences, on all sorts of things about farming, by the Grand Old Man of American agriculture.

Agriculture
Science News-Letter, March 3, 1928

A LABORATORY MANUAL FOR FIRST COURSE IN BOTANY — Arthur T. Evans—*Ginn.* Designed to accompany the text by Pool and Evans.

Biology
Science News-Letter, March 3, 1928

FUR TRUTHS—Abraham Gottlieb—*Harper* ($3). A discussion of furs, the animals that bear them, and the things that furriers do with them, from the point of view of a practical fur man who has been in the business for a third of a century. Although designed primarily for the trade, the book can easily justify for itself a place on the zoologist's bookshelf.

Zoology
Science News-Letter, March 3, 1928

THE WORLD OF ATOMS—Arthur Haas—*Van Nostrand* ($3). In this series of lectures on the constitution of matter, the distinguished professor of physics at the University of Vienna tells in simple language of the foundations of atomic physics, without the aid of mathematics. Lecture No. 10 is probably the first authoritative and popular account that has appeared of the Schrödinger wave mechanics, latest addition to the subject. Dr. Horace S. Uhler, of Yale, translated the book from the original German.

Physics
Science News-Letter, March 3, 1928

ELEMENTS OF CHEMISTRY—Harry N. Holmes and Louis W. Mattern—*Macmillan.* A new printing of a well-written elementary text-book of chemistry. The great attention paid to common applications, and the illustrations, make the book interesting to the student.

Chemistry
Science News-Letter, March 3, 1928

THE PROPERTIES OF SILICA—Robert B. Sosman — *Chemical Catalog* ($12.50). Several years were required to assemble between two covers the information on the work done in the last two decades on this universally important compound.

Chemistry
Science News-Letter, March 3, 1928

LEFAX RADIO HANDBOOK—J. H. Dellinger—*Lefax* ($3.50). Produced in loose-leaf form, this book now revised is capable of keeping abreast of radio progress. With the chief of the U. S. Bureau of Standards radio laboratory as author it is authoritative and clearly written.

Radio
Science News-Letter, March 3, 1928

PHYSICAL OCEANOGRAPHY OF THE GULF OF MAINE—Henry B. Bigelow —*U. S. Dept. of Commerce* ($1.50). An exhaustive monograph of the oceanography of one of our most important maritime districts.

Oceanography
Science News-Letter, March 3, 1928

MORE WORDS, ANCIENT AND MODERN—Ernest Weekley—*Dutton* (2). Would you know the family history of such words as banshee, bootlegger, mealy-mouthed, stepmother, werwolf? This book, by a scholarly Englishman who understands the American language as well as his own, tells for several score of them details for which dictionaries lack space.

Philology
Science News-Letter, March 3, 1928

THE MECHANICS OF THE DIGESTIVE TRACT—Walter C. Alvarez—*Hoeber* ($7.50). A splendidly gotten up work on a highly important section of the field of physiology, embodying the results of the most recent researches. It will be invaluable to members of the medical profession and to advanced students preparing for it. For the latter, an additional valuable feature is the series of portraits of present-day leaders in physiology.

Physiology
Science News-Letter, March 3, 1928

PSYCHOLOGY AND ATHLETICS — Coleman R. Griffith—*Scribner* ($2). Only comparatively recently has it been recognized that the psychologist has anything to contribute towards the creation of winning teams. Here is a concise manual, for either the coach or the athlete, telling how to apply this knowledge.

Psychology—Sports
Science News-Letter, March 3, 1928

UNDERSTANDING HUMAN NATURE—Alfred Adler—*Greenberg.* Psychology applied to the business of every-day living. The book is written in a bright, commonsense style that will appeal to all classes of readers. The omission of an index, however, is inexcusable.

Psychology
Science News-Letter, March 3, 1928

DREAMS—Percy Goldthwait Stiles —*Harvard* ($1.50). There is a peculiar satisfaction in reading about someone else's dreams, doubtless because it reveals to us an ordinarily hidden phase of their life. Mr. Stiles, who calls himself an amateur collector of dreams, here sets down some of the most interesting of his collection, all his own, and made over a long period of time.

Psychology
Science News-Letter, March 3, 1928

THE UNIQUE STATUS OF MAN—Herbert Wildon Carr — *Macmillan* ($1.75). An endeavor to demonstrate by philosophical methods the ancient claim that, though on his physical side man is an animal, yet between him and other animals a great spiritual gulf is fixed.

Philosophy-Evolution
Science News-Letter, March 3, 1928

THE REALM OF ESSENCE—George Santayana — *Scribners* ($3.50). A searching metaphysical essay by one of the best-known of American philosophers.

Philosophy
Science News-Letter, March 3, 1928

A Statement of Purpose

(The aims, ideals and aspirations of an institution)

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Science Service spares no pains or expense in the endeavor (1) to get the best possible quality of popular science writing and (2) to get it to the largest possible number of readers. If in doing this it can make both ends meet, so much the better. If not, it will do it anyway.

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Science Service began its work on January 1, 1921, and has now a sizable office staff with a large corps of contributors in the chief research institutions of this country and Europe.